specified relation type between said selected entity instance record and a specified entity instance record, wherein said entity definition table means, said entity instance table means, said relation definition table means and said relation instance definition means are part of a relational database;

means, operatively coupled to said relation definition table means, for retrieving from said relation definition table means said relation type record defining said specified relation type;

means, operatively coupled to said relation definition table retrieving means and to said relation instance table means, for retrieving from said relation instance table means said relation instance record wherein said selected entity instance record is specified in said relation instance record by a selected entity type and a record identifier;

means, operatively coupled to said relation instance retrieving means and said entity definition table means, for retrieving from said entity definition table means said entity type record defining said selected entity type; and

means, operatively coupled to said entity type record retrieving means and said entity instance table means, for retrieving from said entity instance table means said selected entity instance record;

wherein said entity instance table means is specified by said retrieved entity type record; and

further wherein said selected entity instance record is a record identified by said record identifier in said entity instance table means.

70. The relational database processing system of Claim 69 wherein said retrieved relation type record further comprises a table identifier, wherein said table identifier identifies a relation instance table in said relation instance table means; and

further wherein said means for retrieving a relation instance record further comprises means for retrieving from said relation instance table a relation instance record having data identifying said specified entity instance record and said selected entity instance record.

71. The relational database processing system of Claim 69 wherein said memory means further contains inquiry table means comprised of at least one inquiry record, wherein said inquiry record specifies said specified relation type and said specified entity instance record, said relational database processing system further comprising:

means, operatively coupled to said inquiry table means and said relation definition table retrieving means, for retrieving from said inquiry table means said inquiry record.

72. In a computer system, a data processing system for maintaining cardinality in a relational database, said data processing system comprising:

memory means containing (i) relation definition table means comprised of at least one relation type record wherein each relation type record defines a relation type and includes cardinality data defining cardinality of said relation type and (ii) relation instance table means comprised of at least one relation instance record, wherein said relation definition table means and said

relation instance table means are a part of said relational database;

means, operatively coupled to said relation definition table means and said relation instance table means, for storing a plurality of relation instance records in said relation instance table means, wherein each relation instance record defines a relation of one of said relation types and further wherein said relation is between two entities; and

means, operatively coupled to said relation instance record storing means, for detecting a cardinality violation for a first relation type, said means for detecting comprising

means for determining whether said relation instance table means contains a first relation instance record, that defines a first relation of said first relation type between a first entity and a second entity; and

means for determining whether said relation instance table means contains a second relation instance record that defines a second relation of said first relation type between said first entity and a third entity.

73.   The data processing system of Claim 72 wherein each relation instance record defines a relation between a head entity and a tail entity; and

further wherein said first entity is a head entity and said second and third entities are tail entities.

74.   The data processing system of Claim 72 wherein each relation instance record defines a relation between a head entity and a tail entity; and

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further wherein said first entity is a tail entity
and said second and third entities are head entities.

75.   In a computer system, a data processing system for
maintaining mandatory relations in a relational database, said
data processing system comprising:

memory means containing (i) relation definition table
means comprised of at least one relation type record
wherein each relation type record (a) defines a relation
type between two entity types and (b) includes mandatory
coupling data defining mandatory coupling of said relation
type, (ii) entity instance table means comprised of at
least one entity instance record, and (iii) relation
instance table means comprised of at least one relation
instance record, wherein each relation instance record
defines a relation of a relation type defined by one of
said relation type records and further wherein said
relation is between a head entity instance record and a
tail entity instance record, wherein said relation
definition table means, said entity instance table means
and said relation instance table means are part of said
relational database;

means, operatively coupled to said entity instance
table means, for storing an entity instance record in said
entity instance table means; and

means, operatively coupled to said relation instance
record storing means, for detecting a mandatory coupling
violation for a first relation type, said means for
detecting comprising

means for determining whether said entity
instance table means contains a first entity instance
record of said first entity type; and

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means for determining whether said relation
instance table means contains a relation instance
record defining a relation of said first relation
type between said first entity instance record and a
second entity instance record of said second entity
type.

76.   In a computer system, a data processing system for
retrieving a selected entity from a relational database, said
data processing system comprising:

memory means containing a plurality of entities,
wherein said entities are part of said relational
database;

means, operatively coupled to said memory means, for
storing a first search path record wherein said first
search path record identifies a first entity and a first
relation;

means, operatively coupled to said first search path
storing means, for retrieving from said relational
database a second entity wherein said second entity is
related to said first entity by said first relation;

means, operatively coupled to said memory means, for
storing a second search path record wherein said second
search path record identifies a second relation; and

means, operatively coupled to said second search path
storing means and to said second entity retrieving means,
for retrieving from said relational database said selected
entity wherein said selected entity is related to said
second entity by said second relation.

77.   The data processing system of Claim 76 wherein said
first search path storing means and said second search path
storing means include inquiry definition table means.

78. The data processing system of Claim 76 further comprising means, operatively coupled to said second entity retrieving means and to said selected entity retrieving means, for storing said second entity in an abbreviated results gathering means.

79. In a computer system, a data processing system for retrieving a selected group of one or more entities from a relational database, said data processing system comprising:

memory means containing a plurality of entities, wherein said entities are part of said relational database;

means, operatively coupled to said memory means, for storing a first search path record wherein said first search path record identifies a first entity and a first relation;

means, operatively coupled to said first search path storing means, for retrieving from said relational database a first group of entities comprising all entities within said relational database related to said first entity by said first relation;

means, operatively coupled to said memory means, for storing a second search path record wherein said second search path record identifies a second relation; and

means, operatively coupled to said second search path storing means and to said first group of entities retrieving means, for retrieving from said relational database said selected group of one or more entities wherein said selected group of one or more entities comprises all entities within said relational database related to at least one of said first group of entities by said second relation.

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80. The data processing system of Claim 79 wherein said first search path storing means and said second search path storing means include an inquiry definition table means.

81. The data processing system of Claim 79 further comprising means, operatively coupled to said first group of entities retrieving means and to said selected group of one or more entities retrieving means, for storing said first group of entities in an abbreviated results gathering means.

82. A computer method for retrieving a selected entity from a relational database wherein said selected entity is related to a specified entity by a specified relation type, said method comprising:

retrieving from relation definition table means of said relational database a relation type record wherein said relation type record defines said specified relation type;

retrieving from relation instance table means of said relational database a relation instance record defining a relation of said specified relation type between said specified entity and said selected entity wherein said relation instance record specifies said selected entity by a selected entity type and a record identifier;

retrieving from entity definition table means of said relational database an entity type record wherein said retrieved entity type record defines said selected entity type and specifies an entity instance table of said relational database; and

retrieving from said entity instance table means specified by said retrieved entity type record said selected entity, wherein said selected entity comprises a

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record identified by said retrieved record identifier in said entity instance table means.

83. The method of Claim 82 wherein the step of retrieving a relation instance record comprises:

retrieving from said relation type record a table identifier wherein said table identifier identifies a relation instance table in said relation instance table means; and

retrieving from said relation instance table said relation instance record.

84. The method of Claim 82 further comprising the step of retrieving from inquiry table means data specifying said specified relation type prior to the step of retrieving a relation type record.

85. The method of Claim 82 further comprising the step of retrieving from inquiry table means data specifying said specified entity prior to the step of retrieving a relation instance record.

86. A computer method for maintaining cardinality in a relational database, said method comprising:

storing in relation definition table means of said relational database a plurality of relation type records wherein each said relation type record defines a relation type and includes cardinality data defining cardinality of said relation type;

storing in relation instance table means of said relational database a plurality of relation instance records wherein each said relation instance record defines a relation of a relation type defined by one of said

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relation type records and further wherein said relation is between two entities; and

detecting a cardinality violation for a first relation type wherein said step of detecting comprises

determining whether said relation instance table means contains a first relation instance record defining a first relation of a first relation type between a first entity and a second entity; and

determining whether said relation instance table means contains a second relation instance record that defines a second relation of said first relation type between said first entity and a third entity.

87. The method of Claim 86 wherein each relation instance record defines a relation between a head entity and a tail entity; and

further wherein said first entity is a head entity and said second and third entities are tail entities.

88. The method of Claim 86 wherein each relation instance record defines a relation between a head entity and a tail entity; and

further wherein said first entity is a tail entity and said second and third entities are head entities.

89. A computer method for maintaining mandatory relations in a relational database, said method comprising:

storing a plurality of relation type records in relation definition table means of said relational database wherein each said relation type record defines a relation type between two entity types and includes mandatory coupling data defining mandatory coupling of said relation type;

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storing one or more entity instance records in entity instance table means of said relational database;

storing a plurality of relation instance records in relation instance table means of said relational database wherein each said relation instance record defines a relation of a relation type defined by one of said relation type records and further wherein said relation is between two entity instance records; and

detecting a mandatory coupling violation for a first relation type record defining a first relation type between a first entity type and a second entity type, said step of detecting comprising

determining whether said entity instance table means contains a first entity instance record of said first entity instance type; and

determining whether said relation instance table means contains no relation instance record defining a relation between said first entity instance record and a second entity instance record of said second entity type.

90. A computer method for retrieving a selected entity from a relational database, said method comprising:

forming a first search path record wherein said first search path record identifies a first entity and a first relation;

retrieving from said relational database in response to said first search path record a second entity wherein said second entity is related to said first entity by said first relation;

forming a second search path record wherein said second search path record identifies a second relation; and

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retrieving from said relational database in response to said second search path record said selected entity wherein said selected entity is related to said second entity by said second relation.

91.   The method of Claim 90 further comprising the step of storing said first and second search paths in inquiry definition table means.

92.   The method of Claim 90 further comprising the step of storing said second entity in abbreviated results gathering means.

93.   A computer method for retrieving a selected group of one or more entities from a relational database, said method comprising:

forming a first search path record wherein said first search path record identifies a first entity and a first relation;

retrieving from said relational database a first group of entities comprising all entities within said relational database related to said first entity by said first relation;

forming a second search path record wherein said second search path record identifies a second relation; and

retrieving from said relational database said selected group of entities wherein said selected group of entities comprises all entities within said relational database related to at least one of said first group of entities by said second relation.

94. The method of Claim 93 further comprising the step of storing said first and second search paths in inquiry definition table means.

95. The method of Claim 93 further comprising the step of storing said first set of entities in abbreviated results gathering means.

96. In a computer system, a data processing system for retrieving a selected entity from a relational database, said data processing system comprising:

memory means containing a plurality of entities, wherein said entities are part of said relational database;

means, operatively coupled to said memory means, for storing a first search path record wherein said first search path record identifies a first relation;

means, operatively coupled to said first search path storing means, for retrieving from said relational database a first entity wherein said first entity is related to a second entity by said first relation;

means, operatively coupled to said memory means, for storing a second search path record wherein said second search path record identifies a second relation; and

means, operatively coupled to said second search path storing means and to said first entity retrieving means, for retrieving from said relational database said selected entity wherein said selected entity is related to said first entity by said second relation.

97. In a computer system, a data processing system for retrieving a selected group of one or more entities from a relational database, said data processing system comprising:

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memory means containing a plurality of entities, wherein said entities are part of said relational database;

means, operatively coupled to said memory means, for storing a first search path record wherein said first search path record identifies a first relation;

means, operatively coupled to said first search path storing means, for retrieving from said relational database a first group of entities comprising all entities within said relational database related to at least one of said entities by said first relation;

means, operatively coupled to said memory means, for storing a second search path record wherein said second search path record identifies a second relation; and

means, operatively coupled to said second search path storing means and to said first group of entities retrieving means, for retrieving from said relational database said selected group of one or more entities wherein said selected group of one or more entities comprises all entities within said relational database related to at least one of said first group of entities by said second relation.

98. A computer method for retrieving a selected entity from a relational database, said method comprising:

forming a first search path record wherein said first search path record identifies a first relation;

retrieving from said relational database in response to said first search path record a first entity wherein said first entity is related to a second entity by said first relation;

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forming a second search path record wherein said

second search path record identifies a second relation;

and

retrieving from said relational database in response

to said second search path record said selected entity

wherein said selected entity is related to said first

entity by said second relation.

99. A computer method for retrieving a selected group of

one or more entities from a relational database, said method

comprising:

forming a first search path record wherein said first

search path record identifies a first relation;

retrieving from said relational database a first

group of entities comprising all entities within said

relational database related to at least one of said

entities by said first relation;

forming a second search path record wherein said

second search path record identifies a second relation;

and

retrieving from said relational database said

selected group of entities wherein said selected group of

entities comprises all entities within said relational

database related to at least one of said first group of

entities by said second relation.--

REMARKS

In an Office Action dated March 30, 1992, the Examiner

rejected Claims 14-20 and 22 under 35 U.S.C. § 101, (ii)

rejected Claims 1-22 under 35 U.S.C. § 112, second paragraph

and (iii) rejected Claims 2 and 11 under 35 U.S.C. § 112, sixth

paragraph, (iv) rejected Claims 2, 5, 6, 12 and 18-21 under 35

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